

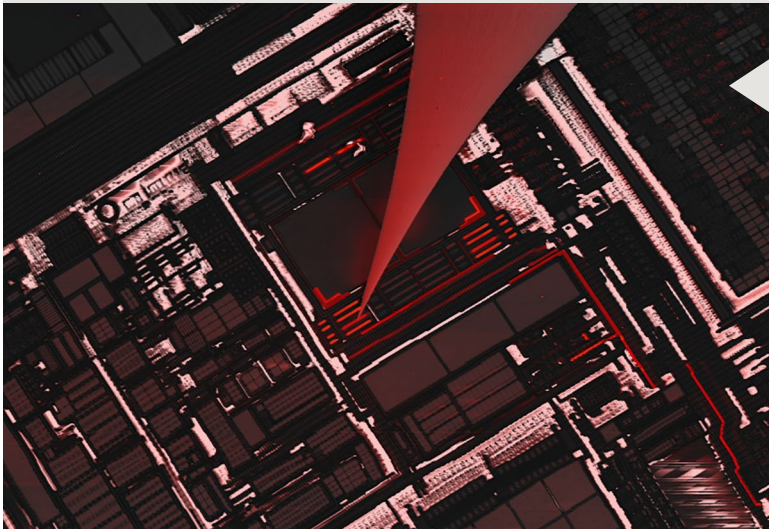
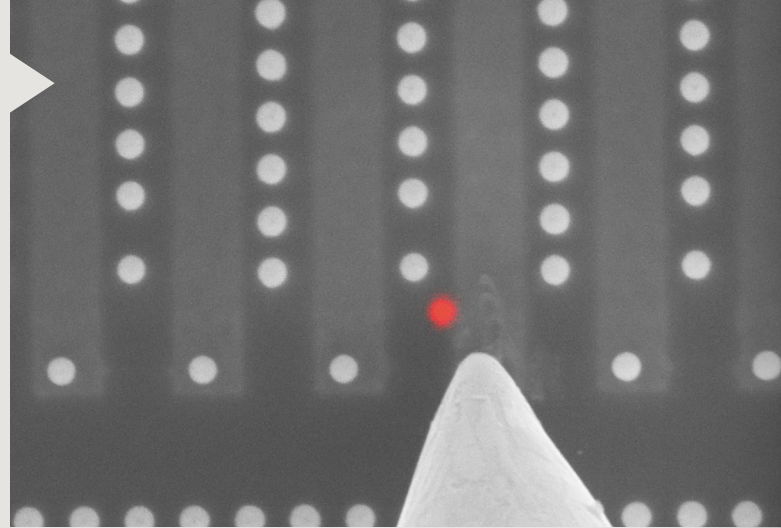
# Electrical Failure Analysis

Dedicated equipment for Failure Analysis, from entry-level to the cutting edge

# The unique benefits of Electrical Failure Analysis

## Employ the full range of EFA techniques

- Electron Beam Induced Current (EBIC)
- Electron Beam Absorbed Current (EBAC)
- Resistive Contrast Imaging (EBAC/RCI)
- Electron Beam Induced Resistance Change (EBIRCh)



## Characterize interconnects with highest resolution

- Reveal electrical integrity of nets with sub-micron lateral resolution and bridge from EFA to PFA
- Diagnose fabrication and long term issues, including contamination, metal patterning defects, resistive interconnectors, or electro-migration
- Directly isolate defects to the exact layer and die location, and improve time to product improvement actions

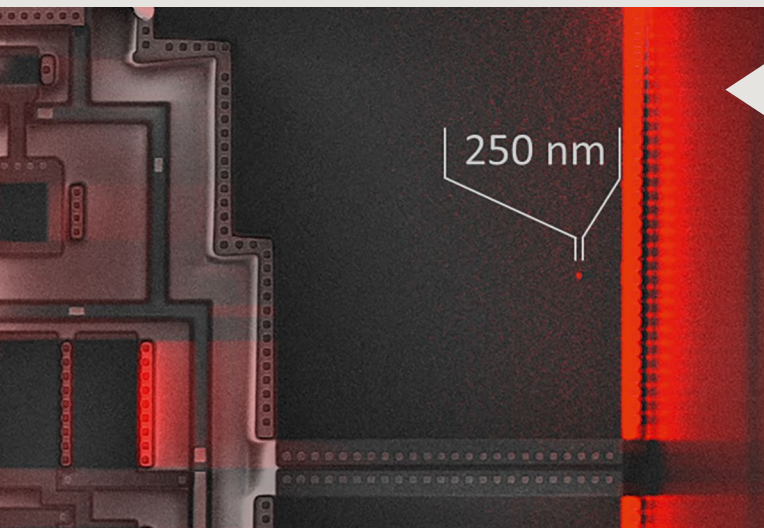
## Map junctions and defects with the highest possible resolution

- Correlate structural defects with electrical activity
- Map active areas of junctions and electrical fields
- Validate doping profiles and areas



### Find exact location of any open, resistive or shorting defect

- Localize metal line cuts caused by cracking, corrosion, electro-migration, or foreign particles
- Identify resistive opens caused by interface contamination at via interconnects
- Pinpoint location for direct TEM lamella FIB preparation



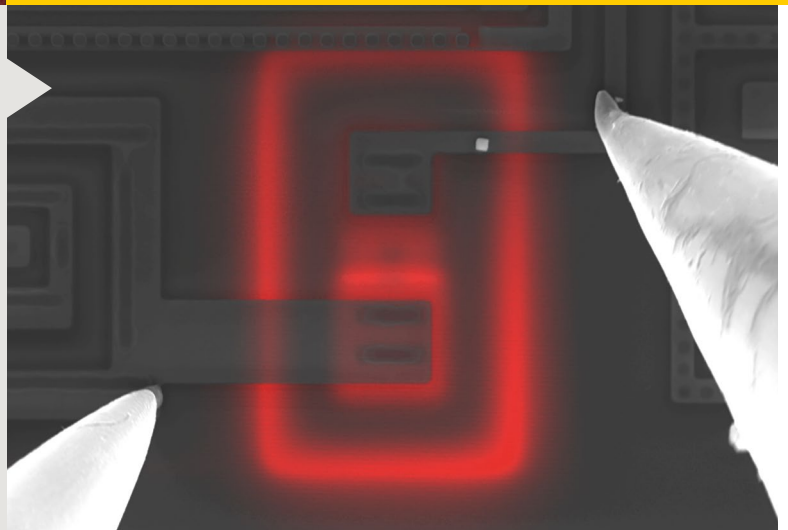
### Localize defects in thin dielectric layers

- Visualise and localise weaknesses in gate oxide (GOX) and capacitor oxide (COX) before breakdown
- Pinpoint oxide shorts caused by ESD or EOS with sub-micron resolution
- Preserve the original defect signature with power dissipation in the lower nW range during localization

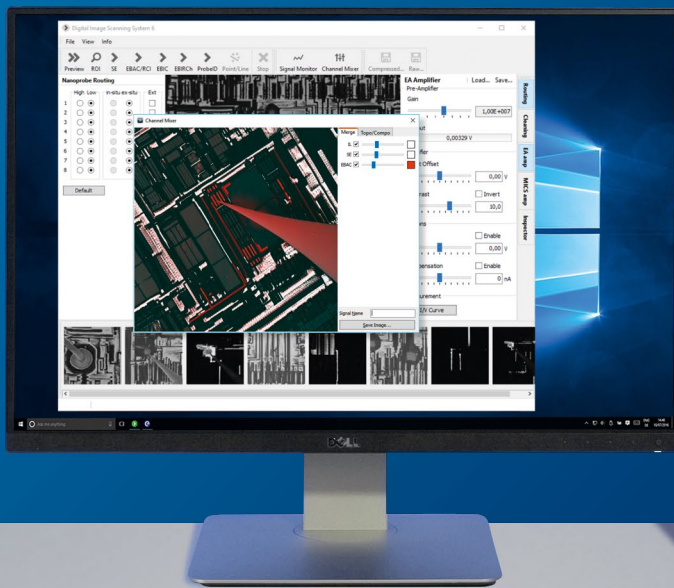
EFA

### Verify device operation modes with built-in biasing and live colour

- Image junctions and fields in delayered devices
- Map electrical activity of solar cells under bias
- Compare imaged behaviour with device modelling



# Designed for ease-of-use and performance



## Electronics for FA workflows

- Automated routing to probes
- Fast and low-noise amplification
- Integrated live imaging\*
- Automated needle cleaning\*
- In-situ preamp for low impedance cases\*



\* optional

# EFA



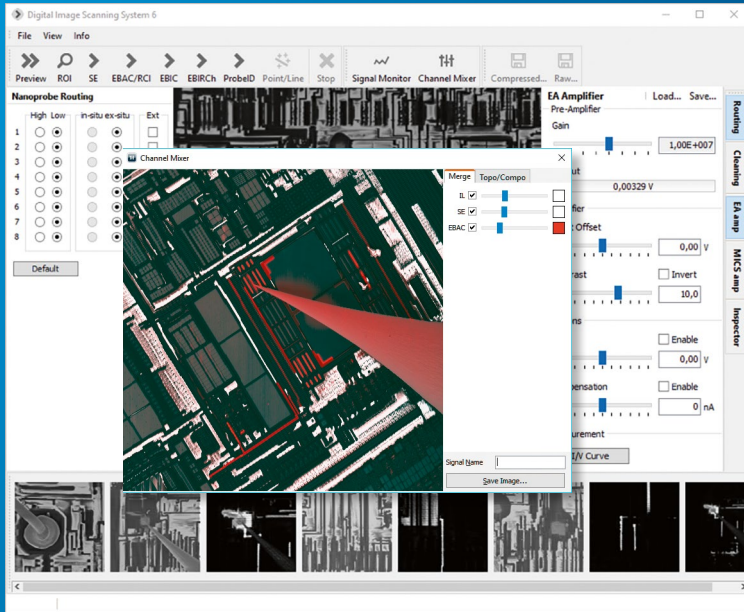
## EA DISS6 imaging

- Integrated scan generator and image acquisition
- Very large resolution and high speed
- High bit depth EFA analog-to-digital conversion
- Simultaneous SE and EFA inputs

## EFA controller

- Automated routing for up to 8 probes
- In-situ electronics for low impedance failure cases
- Two stage amplification for maximum range & highest speed
- Built-in sources for voltage bias and current compensation
- New optional integrated needle cleaning PSUs



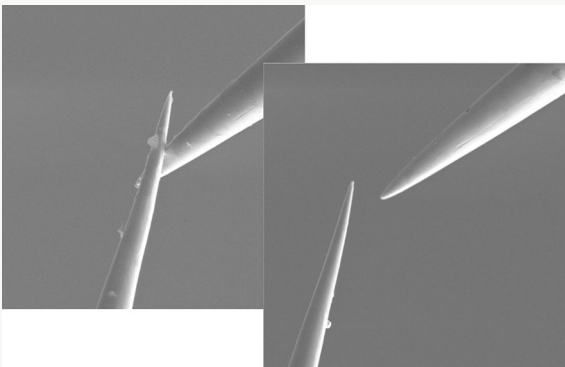
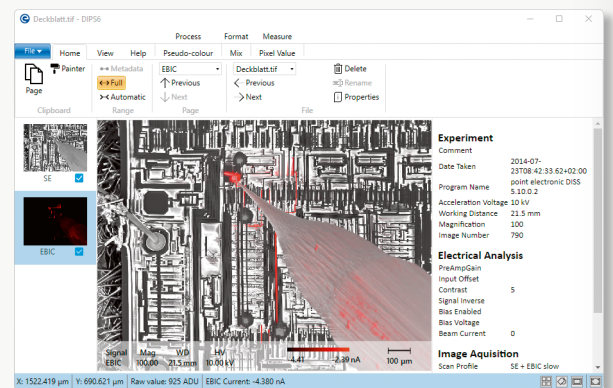


## DISS6 - control and acquisition app

- Routing and amplification control
- Live colour mix for localisation
- Current-Voltage sweep tool
- Needle cleaning tool
- Automatic quantification to fA ...  $\mu$ A units
- Standard file formats

## DIPS6 - processing app

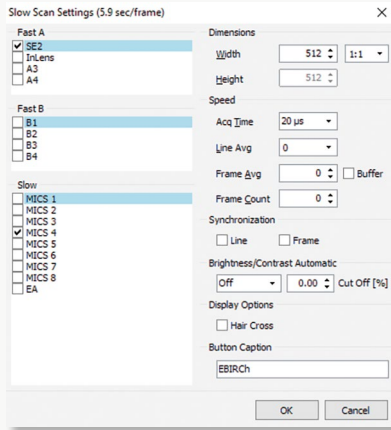
- Colour mix of pages for localisation
- Full image and metadata viewer
- Automatic quantification to  $\mu$ A...fA
- Gradient-based pseudocolours
- Export of quantitative pixel values



## Needle cleaning tool

- High voltage mode to break oxide
- High current mode to evaporate contamination
- Procedure is automated for ease-of-use
- Power is carefully controlled to maximise success rate

# Integrated and easy-to-use quantitative software



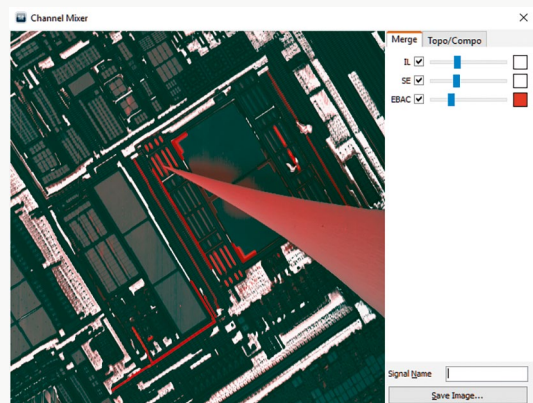
## Optimised configurable workflow

- Set scan profiles for highest efficiency
- Fast scans for navigation and alignment
- Simultaneous scan profile for localization
- High resolution scan profile for data acquisition

# EFA

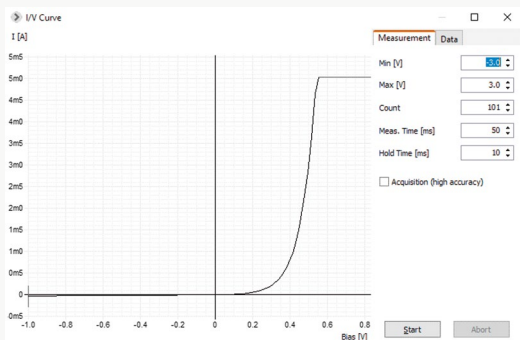
## Live colour view

- Fast EBAC profile for alignment and navigation
- Simultaneous SE/EBAC profile for localization
- High resolution EBAC profile for mapping and analysis



## Current-voltage (IV) tool

- Determine if electrical connections are made
- Double check for electron beam damage
- Select suitable bias voltage for EBIRCh and EBIC



## EFA controller

<b>Inputs</b>	8x BNC inputs from nanoprobe
<b>Outputs</b>	8x BNC outputs for external device analyser(s)
	1x BNC amplifier EFA signal for imaging
	1x D-SUB power and control for in-situ electronics
<b>Routing</b>	8x to in-situ/ex-situ high/low or external
	High to EA amp or needle cleaning (optional)
	Low to Ground or Bias Voltage
<b>Ex-situ pre-amplifier</b>	10 <sup>3</sup> ... 10 <sup>10</sup> V/A variable <b>ex-situ gain</b>
	0.5 MHz bandwidth at 10 <sup>9</sup> V/A
<b>EA amplification</b>	0.1 ... 100x, 16-bit contrast
	0...1 V, 16-bit brightness
	Analog signal inversion
	8 levels low-pass filter
	manual zero/dark correction
<b>Internal sources</b>	-10 ... 10 V, 16-bit bias voltage
	-10 ... 10 $\mu$ A, 16-bit compensation current
<b>In-situ preamplifiers (optional)</b>	8x 10 <sup>7</sup> V/A fixed in-situ gain
	0.1 MHz bandwidth
<b>Needle cleaning (optional)</b>	0 ... 10 V, 0 ... 10 $\mu$ A mode to break oxide
	0 ... 2 V, 0 ... 20 mA mode to evaporate contamination
	Programmable automatic ramps/sweeps
	Live current and voltage monitors



## EFA DISS6 imaging

<b>Signal inputs</b>	1x calibrated ex-situ EA
	8x calibrated in-situ EA (optional)
	4x calibrated SEM
<b>MICS amplification (optional)</b>	-1...1 V input offset (calibrated brightness 1...4)
	1...1,800× gain (calibrated contrast 1...4)
	-1...1 V output offsets (calibrated reference 1...4)
	3.4 MHz ... 34 Hz low-pass filter
<b>Digitization</b>	16-bit ex-situ EA
	12-bit in-situ EA
	12-bit SEM, saved to 16-bit
	32,000× max. oversampling (pixel averaging)
<b>Scan generator</b>	X and Y scan outputs (calibrated)
	beam blank output (optional)
	64k × 64k pixels maximum resolution
	0.5 GPixels maximum frame size (software limit)
	1 μs minimum pixel dwell time (EA input limit)
	6 milliseconds maximum pixel dwell time
	256× max. frame average
	50× max. line average
frame, line, pixel synchronization (optional)	

## PC/Laptop, Display

<b>PC/Laptop</b>	Intel Core i3 minimum
	2x USB 2.0 minimum
<b>Display</b>	1,280 x 1,024 resolution minimum
<b>Operating systems</b>	Windows 11 ... 7
	Network recommended for remote support

**DISS6 app**

<b>EFA routing</b>	8x probes to in-situ, ex-situ or external EA amplifier, Bias, Compensation or Needle Cleaning
<b>Current voltage (IV) control</b>	Voltage range, steps, time CSV data export
<b>EA amplifier control</b>	Gain, Contrast, Brightness, Bias, Compensation, Inv. Save/load amplifier profile
<b>MICS amplifier control</b>	8x Brightness and Contrast
<b>DISS6 imaging control</b>	Configurable scan profiles Signals, pixel size, speed, averaging, sync Manual/automatic image range
<b>Inspector tool</b>	Automatic quantification of pixel values Editable formula files
<b>Image mixing tool</b>	Manual colour assignment Live mix with image export
<b>Save file formats</b>	uncompressed 8-bit or 16-bit multi-page TIF compressed JPEG XMP metadata embedded into TIF and JPEG
<b>Operating systems</b>	Windows 11 ... 7

**DIPS6 app**

<b>Input file formats</b>	uncompressed 8-bit or 16-bit multi-page TIF compressed JPEG XMP metadata embedded into TIF and JPEG
<b>Export file formats</b>	PNG images CSV data with pixel values
<b>View modes</b>	Single page image and metadata Multiple pages/file Layers/image mix view
<b>Quantification</b>	Automatic, using XMP values and formulas Manual, using XML formulas
<b>Pseudo-colour</b>	GGR gradient based colour mapping Automatic and manual control of range
<b>Operating systems</b>	Windows 11 ... 7

## Parts and Cables

EFA controller	Standard	1x
EFA DISS6 imaging	Standard	1x
EFA ground strap	Standard	1x
EFA signal cable	Standard	1x
SEM external scan interface cable	Standard	1x
USB cables	Standard	2x
USB memory stick with software	Standard	1x
EA reference samples	Optional	-
EFA in-situ electronics	Optional	-
Flange with feedtrough	Optional	-
PC, keyboard, mouse	Optional	1x
Display	Optional	1x

## Software packages

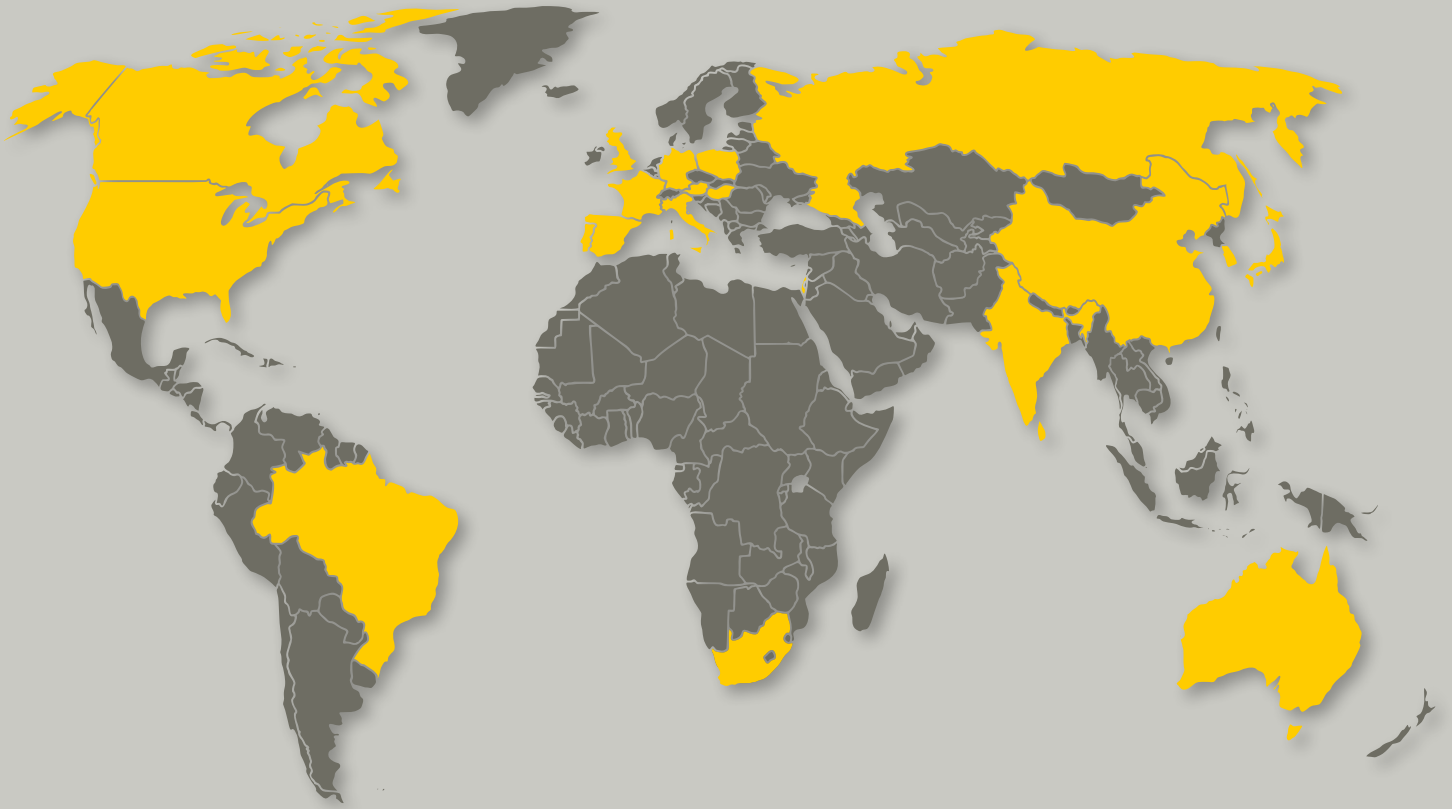
Drivers	PEUSB
Libraries	EBICControl DISS6Control
Apps	DISS6 app DIPS6 app
Server	EMGateway

## Weight & Dimensions

EFA controller	23.5 x 8.7 x 29.5 cm typ. 3.1 kg
EFA DISS6 imaging	23.5 x 8.7 x 29.5 cm typ. 3.7 kg typ.
Shipping	typ. 8.5 kg typ. 36 x 32 x 56 cm

## Site requirements

Power	1x mains 110/220 VAC single phase 50-60 Hz on the same earth as the microscope
Microscope	8x connections to nanoprobes 1x connection to in-situ electronics (optional) 1x connection to SEM earth 1x mixed scan interface and SEM signals connection
Space	EFA controller may be placed in a 19-inch rack or table EFA DISS6 imager may be placed on a 19-inch rack or table



#### **SALES & SERVICE**

[sales@pointelectronic.de](mailto:sales@pointelectronic.de)  
+49 345 1201190

#### **SUPPORT & TRAINING**

[support@pointelectronic.de](mailto:support@pointelectronic.de)  
+49 345 1201190

#### **CUSTOM ENGINEERING**

[engineering@pointelectronic.de](mailto:engineering@pointelectronic.de)  
+49 345 47225619

**point electronic GmbH** | Erich-Neuß-Weg 15 | 06120 Halle (Saale) | Germany  
Tel.: +49 345 1201190 | Fax: +49 345 1201223 | [info@pointelectronic.de](mailto:info@pointelectronic.de) | [www.pointelectronic.de](http://www.pointelectronic.de)